

American beech

Fagus grandifolia



American beech is not a common species in Wisconsin and confined almost exclusively to the eastern part of the state. It's a minor component of the northern hardwoods forest type in Wisconsin. The volume and growth of beech haven't changed much since 1983 but mortality has decreased significantly. In 2015, beech accounted for 0.2% of all volume and growth in Wisconsin, but only 0.1% of total mortality and removals.

Given the relatively lower rates of mortality and removals, the volume of American beech should increase in the future. Models show a 63% increase in the next 40 years.

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Modelling future volumes

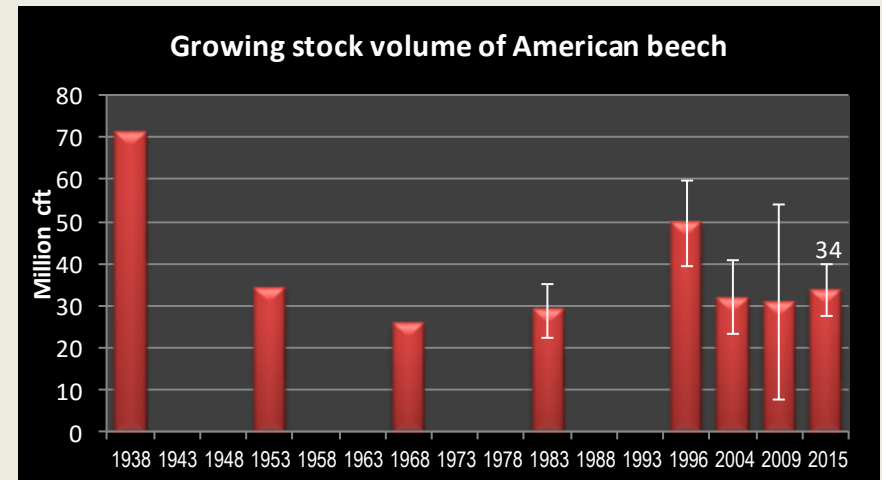
"How has the beech resource changed?"

Growing stock volume and diameter class distribution

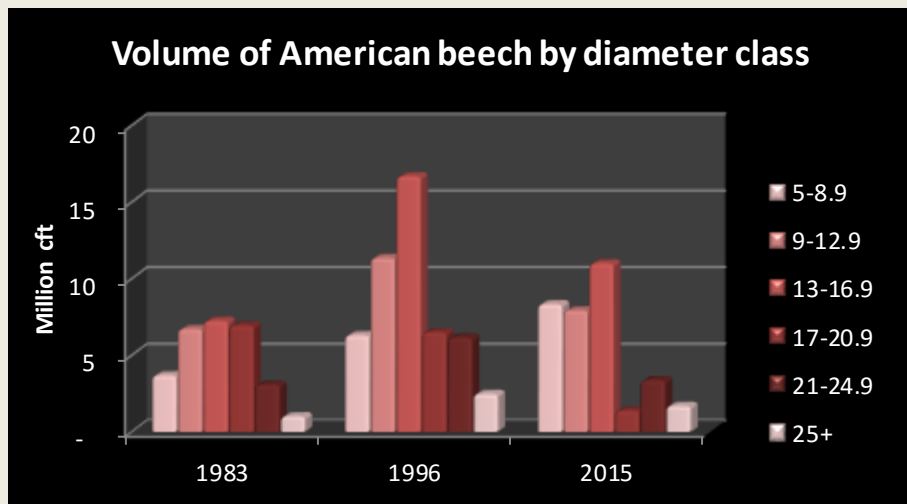
The [growing stock volume](#) of American beech in 2015 was about 34 million cubic feet or 0.2% of total statewide volume (chart on right). Volume has decreased since 1996 but, due to small volumes, sampling errors are very high.

The beech resource has decreased dramatically since 1996 in almost all size classes. For instance, the volume in large trees (over 13 inches in diameter) has decreased by 45% while the volume in small trees has decreased by 8% in this time (chart on left below).

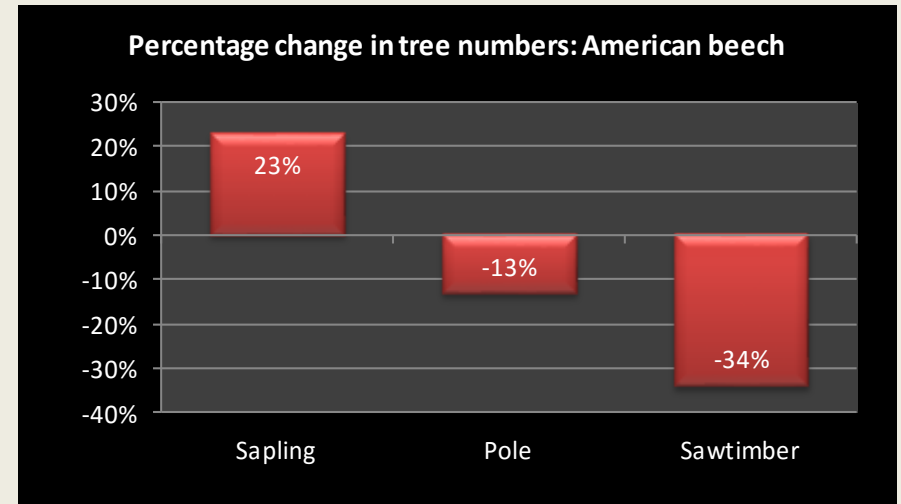
Since 1996 the number of [poles](#) and [sawtimber](#) sized trees has decreased (chart on right below) while the number of [saplings](#) has increased suggesting an uncertain future for American beech.



Growing stock volume (million cubic feet) by inventory year. Bars represent the 67% confidence interval. Source: USDA Forest Inventory and Analysis data.



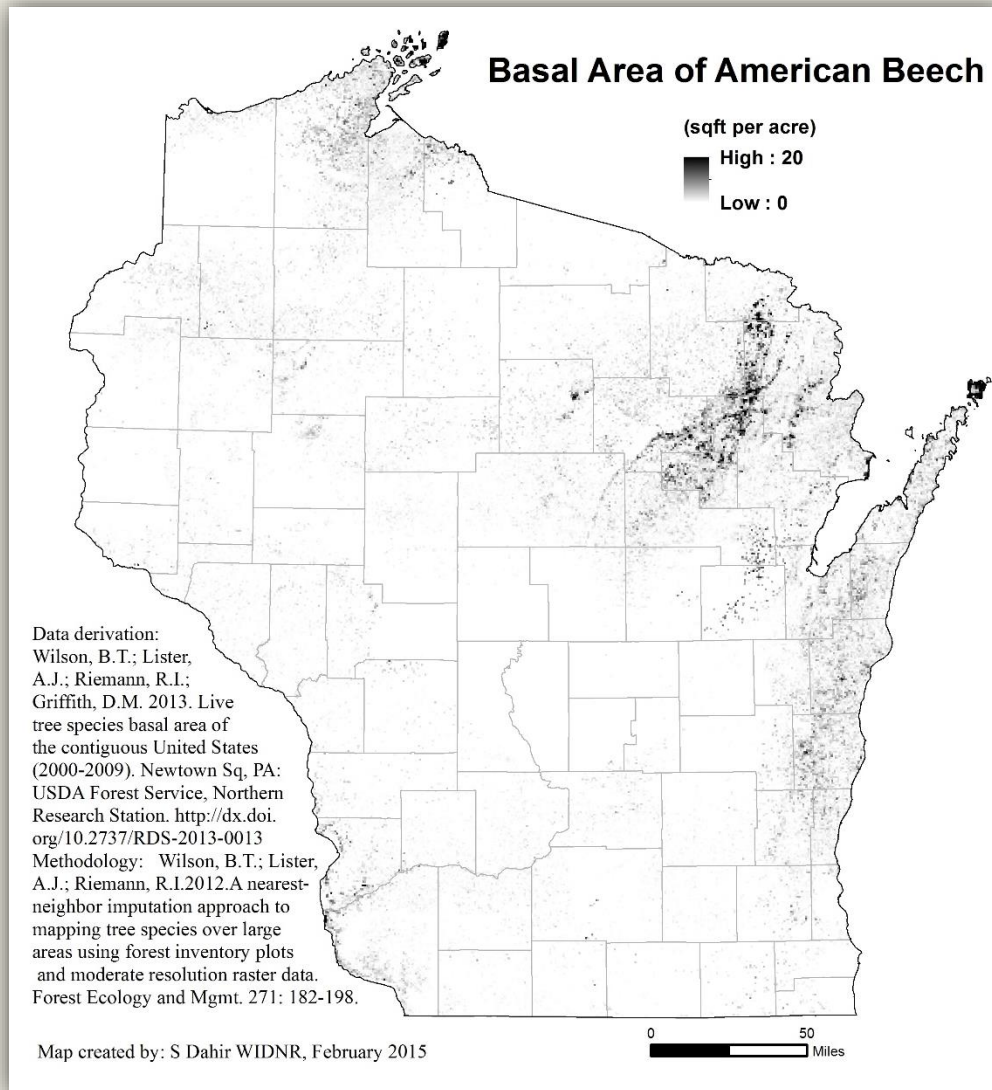
Growing stock volume (trees over 5 inches dbh) by diameter class (inches). Source: USDA Forest Inventory and Analysis data



Percentage change in the number of live trees by size class between 1996 and 2015. Source: USDA Forest Inventory and Analysis data 1996 and 2015.

"Where is beech found in Wisconsin?"

Growing stock volume by region with map



About 56% of all beech volume is located in northeast Wisconsin with the remainder in the southeast part of the state.

About 90% of beech is found on the sugar maple / beech / yellow birch and sugar maple / basswood forest types with another 7% on oak types.

Growing stock volume (million cft) by region of the state.

Species	Central	North east	North west	South east	South west	Total
Beech	-	19	-	15	-	34
% of total	0%	56%	0%	44%	0%	100%

Source: USDA Forest Service, Forest Inventory and Analysis

For a table of **Volume by County** go to:

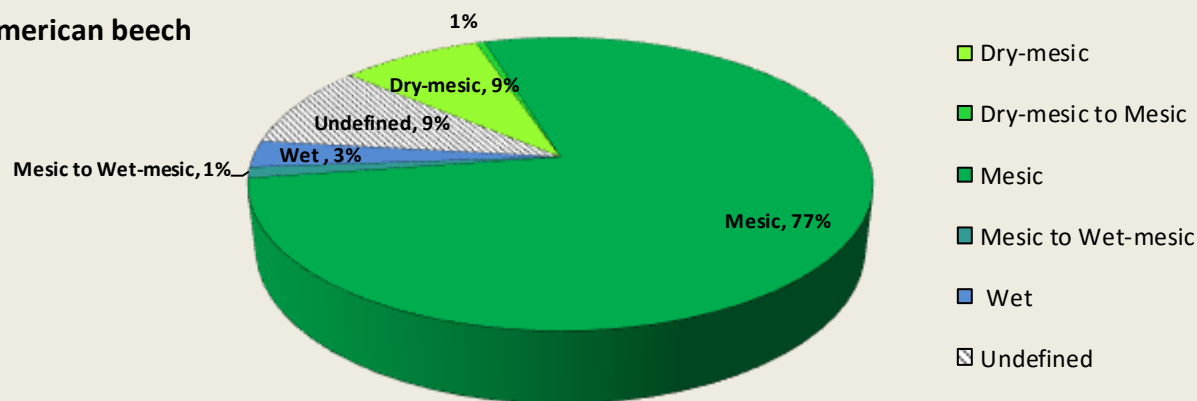
<http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/VolumeCountySpecies.pdf>

"What kind of sites does beech grow on?"

Habitat type and site index distribution

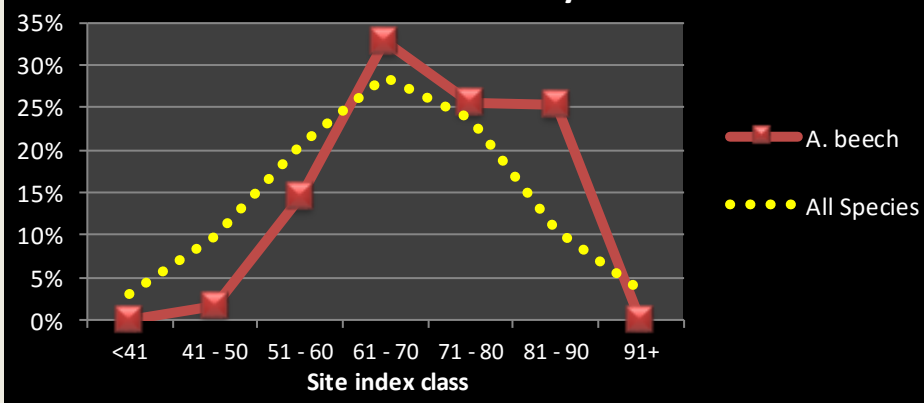
The vast majority of beech volume occurs on mesic habitat types. Only 9% of volume occurs on dry-mesic sites.

American beech



Percent distribution of growing stock volume by habitat type group (USDA Forest Inventory & Analysis data).

Percent of volume by site index



Percent distribution of growing stock volume by site index class (USDA Forest Inventory & Analysis data).

The majority of beech volume occurs on richer sites. Almost 85% is in stands with site indices over 60. As stated, beech occurs mainly on the maple / beech / birch forest type which is more prevalent on higher site indices.

The average site index by volume for beech is 71 compared to 66 for all species.

"How fast is beech growing?"

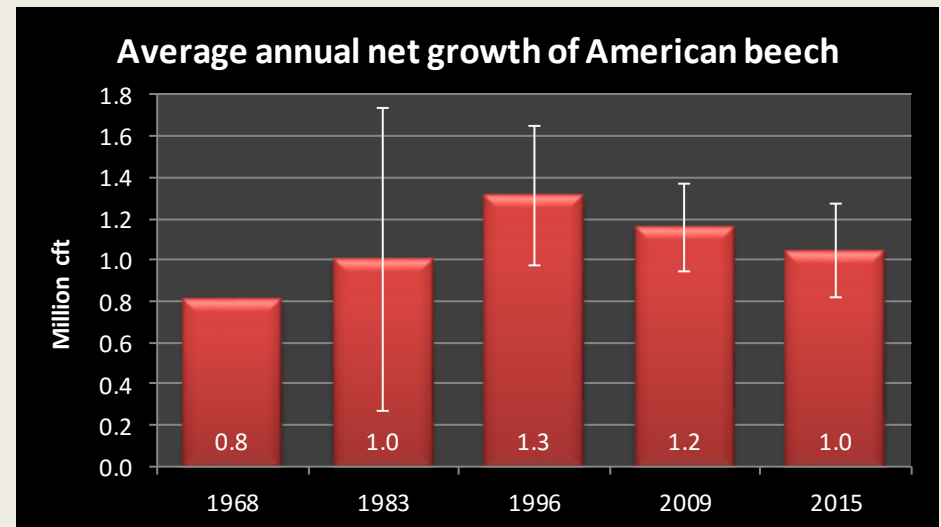
Average annual net growth: trends and ratio of growth to volume

Average annual net growth, about 1 million cubic feet per year from 2010 to 2015, accounts for 0.2% of total statewide growth (chart on right). The growth rate has not changed since 1968.

Average annual net growth (million cft/year) and ratio of growth to volume by region of the state.

Region	Net growth	Percent of total	Ratio of growth to volume
Northeast	0.7	67.9%	3.7%
Northwest	0.0	0.0%	.
Central	0.0	0.0%	.
Southwest	0.0	0.0%	.
Southeast	0.3	32.1%	2.3%
Statewide	1.0	100.0%	3.1%

Source: USDA Forest Inventory and Analysis



Average annual net growth (million cubic feet). Bars represent the 67% confidence interval.

Source: USDA Forest Inventory & Analysis data

The highest volume growth for beech is in the northeast part of the state as is the highest rate of growth to volume.

The average ratio of net growth to volume for beech is 3.1%, higher than the statewide average of 2.7% for all species.

For a table of **Average annual growth, mortality and removals by region** go to:
<http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf>

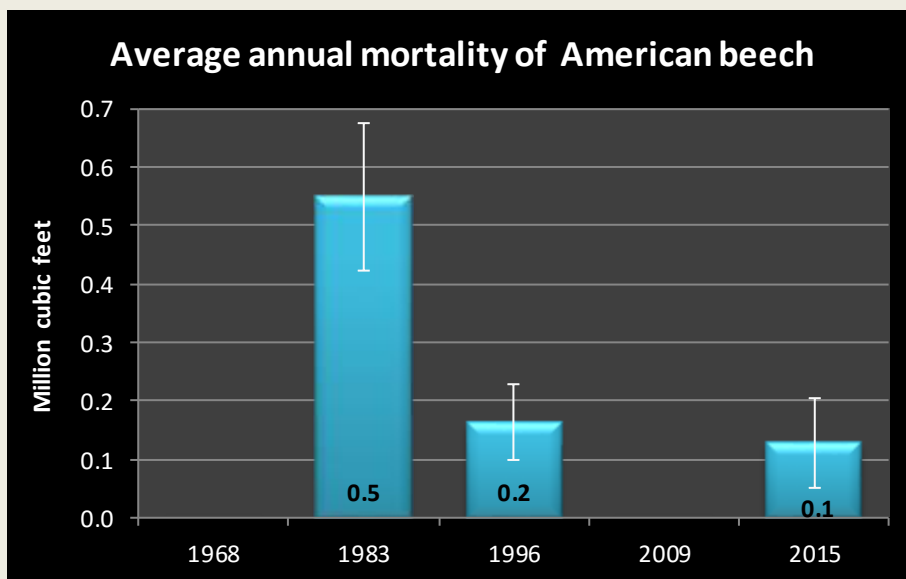


"How healthy is beech in Wisconsin?"

Average annual mortality: trends and ratio of mortality to growth

Average annual mortality of beech from 2010 to 2015 was about 0.1 million cubic feet, or 0.1% of statewide mortality (chart on right). This rate has decreased significantly since 1983.

The ratio of mortality to volume is about 0.4% for beech. This is much lower than the average for all species in Wisconsin which is 1.1%. American beech accounts for 0.2% of volume and growth but only 0.1% of mortality.



Average annual mortality (million cubic feet) by inventory year. Bars represent the 67% confidence interval. Source: USDA Forest Inventory & Analysis data

Mortality, volume and the ratio of mortality to volume.

Species	Average annual mortality (cft)	Volume of growing stock (cft)	Ratio of mortality to volume
American Beech	128,095	33,758,382	0.4%

For a table of **Average annual growth, mortality and removals by region** go to:
<http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf>

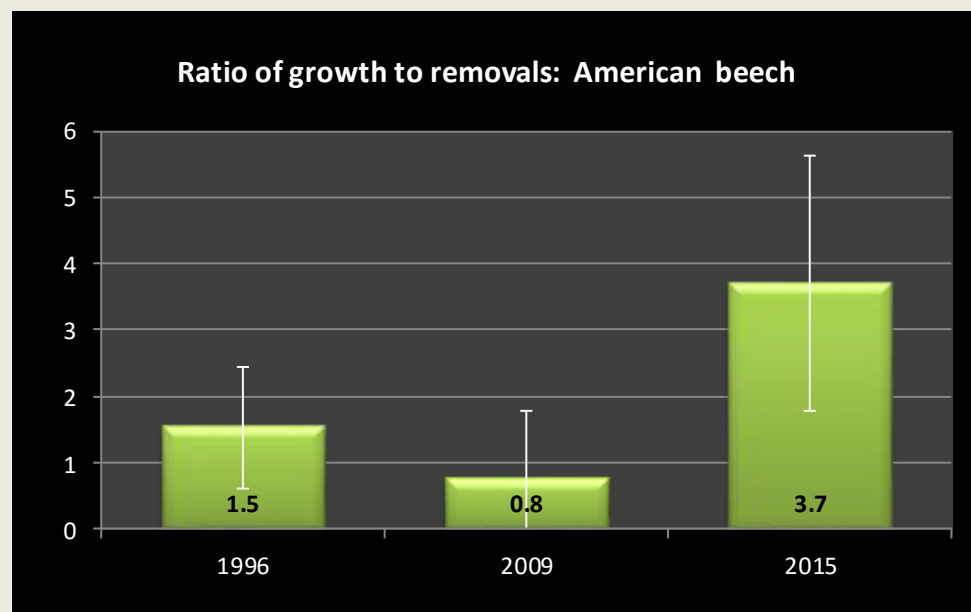


"How much American beech do we harvest?"

Ratio of growth to removals

Removals of American beech totaled 0.3 million cubic feet per year from 2010 to 2015. Beech accounts for 0.2% of growing stock volume but only 0.1% of removals.

The ratio of average annual net growth to removals is 3.7 for beech, over twice as high as the statewide average ratio of 1.7 for all species (chart on left). Growth has remained mostly unchanged since 2009 but removals have fallen 73%.



Ratio of average annual growth to removals. Error bars represent the 67% confidence interval.
Source: USDA Forest Inventory & Analysis data.

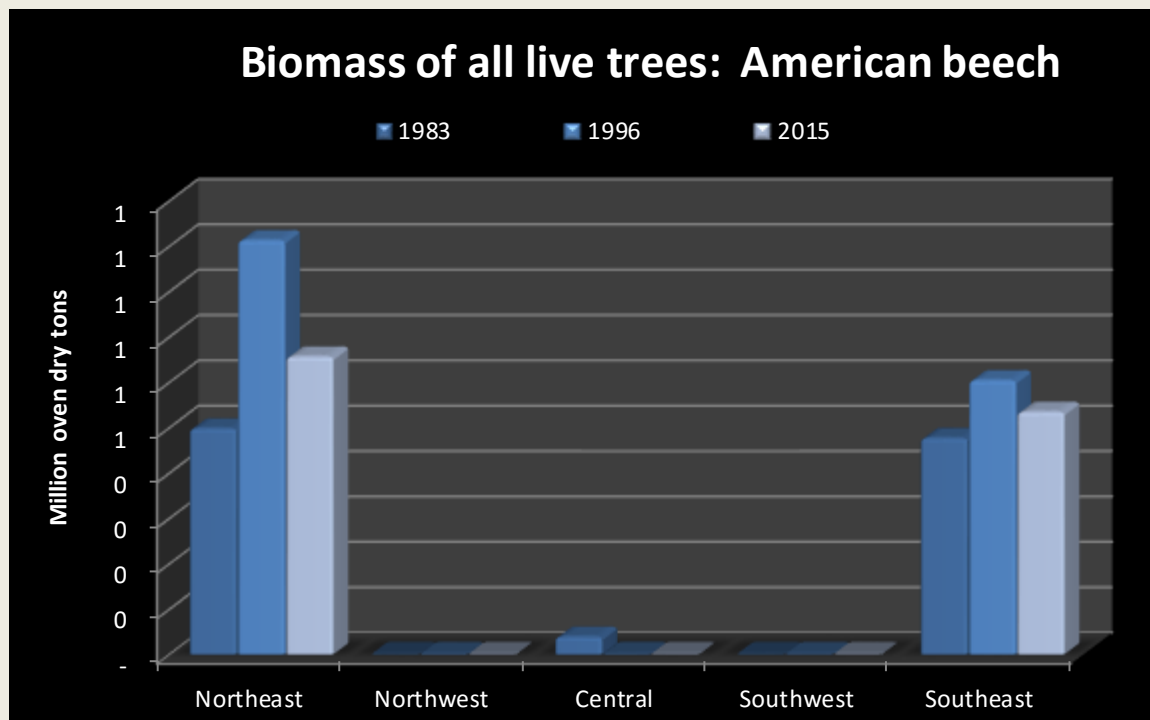
For a table of **Average annual growth, mortality and removals by region** go to:
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"How much beech biomass do we have?"

Tons of aboveground biomass by region of the state

There were 1.2 million short tons of aboveground [biomass](#) in live beech trees in 2015, up from about 1.0 million tons in 1983, an increase of 17%. This is equivalent to approximately 0.6 million tons of carbon and represents 0.2% of all aboveground biomass statewide. As with volume, most beech is located in northeast and southeast Wisconsin (chart below).



Beech has one of the lowest density of any of the commercial species in Wisconsin, with a specific gravity of 0.64 and an average oven dry weight of 39.9 pounds per cubic foot. The average specific gravity for all hardwoods is about 0.56 with an average weight of 34 lbs/cft. Approximately, 73% of all biomass is located in the bole, 19% in tops and limbs and 8% in bark.

Biomass (above ground dry weight of live trees >1 in dbh, short tons) by year and region of the state.
Source: USDA Forest Inventory & Analysis data

For a table of **Biomass by County** go to:

<http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/BiomassByCounty.pdf>

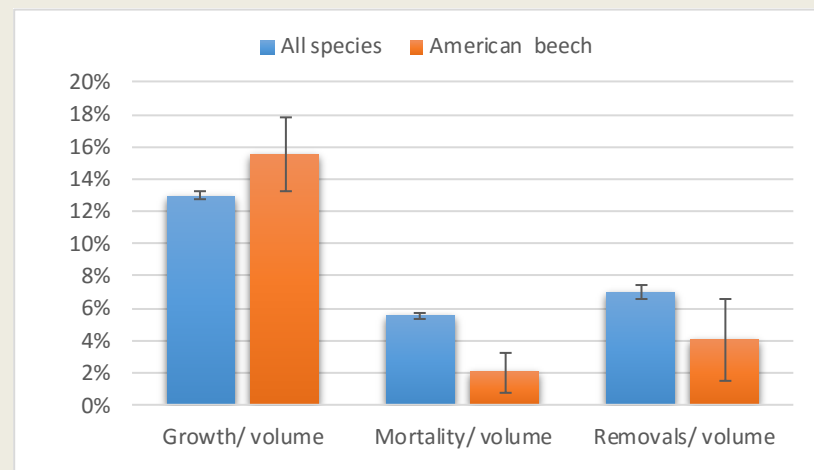
"Can we predict the future of beech?"

Predicted volumes based on current rates of mortality and harvest

The 5-year ratio of growth to volume is significantly higher for beech while the ratios of mortality to volume and removals to volume are significantly lower for beech compared to all species in the state (chart on right). All of these trends indicate a likely increase in volume in the future.

The Forest Vegetation Simulator (FVS¹) was used to predict future volumes of beech through 2054 using current mortality and removal rates.

Volume increases 63% by the year 2054 to 54.1 million cubic feet.



Five year ratios of mortality, removals and growth to volume.
Source: USDA Forest Inventory & Analysis data

